CRWMS/M&O

Design Analysis Cover Sheet

Complete only applicable items.

(1.)

WBS: 1.2.6

QA: ~~QA~~ N/A 03/28/95

Page: 1 Of: 9

2. DESIGN ANALYSIS TITLE

DIESEL FUEL TANK FOUNDATIONS

MOL.19951101.0035

3. DOCUMENT IDENTIFIER	4. REV. NO.	5. TOTAL PAGES
BABBDA000-01717-0200-00007 REV 00	00	9

6. TOTAL ATTACHMENTS/NO. OF PAGES IN EACH	7. SYSTEM ELEMENT
NONE	ESF

	Print Name	Signature	Date
8. Originator	M. Gomez		01/17/95
9. Checker	J. Salchak		01/18/95
10. Lead Discipline Engineer	M. Gomez		01/18/95
11. Department Manager	J. Salchak		01/18/95

12. REMARKS

CRWMS/M&O

Design Analysis Revision Record

Complete only applicable items.

(1.)

WBS: 1.2.6

QA: ~~QA~~ 03/28/95

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BABBDA000-01717-0200-00007 REV 00			00
5. Revision No.	6. Pages Added	7. Pages Deleted	8. Description of Revision
00	9	0	Original Issue

1. PURPOSE

The purpose of this analysis is to design structural foundations for the Diesel Fuel Tank and Fuel Pumps. This analysis is in support of design drawing BABBDF000-01717-2100-23082.

2. QUALITY ASSURANCE

The items considered within this analysis relate to temporary equipment foundations not included on the Q-list. There are no Q-Controls associated with this analysis.

3. METHOD

The equipment foundation shall be designed in Section 10 using standard foundation design hand calculations. The vertical loads will reflect Mechanical requirements. Lateral loads will be calculated using applicable codes. The soil bearing and foundation stresses will be analyzed using accepted engineering mechanics. The foundation will be designed using the Strength Design Method.

4. CODES AND STANDARDS

4.1 U.S. DEPARTMENT OF ENERGY (DOE):

DOE 6430.1A, dated April 6, 1989 — General Design Criteria

4.2 AMERICAN CONCRETE INSTITUTE (ACI):

ACI 318-89 — Building Code Requirements for Reinforced Concrete

4.3 AMERICAN NATIONAL STANDARDS INSTITUTE, INC./AMERICAN SOCIETY OF CIVIL ENGINEERS (ANSI/ASCE):

ANSI/ASCE 7-88 — Minimum Design Loads for Buildings and Other Structures

4.4 UNIFORM BUILDING CODE (UBC):

UBC, 1991

4.5 AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC):

AISC, 9th Edition — Manual of Steel Construction, Allowable Stress Design

4.6 AMERICAN WELDING SOCIETY (AWS)

AWS D1.1-94 Structural Welding Code-Steel

5. DESIGN INPUTS

5.1 Exploratory Studies Facility (ESF) Basis for Design (BFD) Document, Package 1D, Section 7.2.4.6 Surface Compressed Air System (BAB000000-01717-6300-00002, Rev. 05)

6. CRITERIA

6.1 The Exploratory Studies Facility Design Requirements (ESFDR) (YMP/CM-0019, Rev. 1)

6.2 ESF BFD Document, Package 1D (BAB000000-01717-6300-00002, Rev. 05)

6.3 Determination of Importance Evaluation for ESF North Portal Pad (BABB00000-01717-0200-00001 Rev. 04)

7. ASSUMPTIONS

None used.

8. REFERENCES

8.1 Geotechnical Recommendations for Design, North Ramp Surface Facility, Exploratory Studies Facility, Yucca Mountain Project, Nevada, SCP No. 8.3.1.14.2. (March 19, 1993)

9. COMPUTER PROGRAMS

None used.

10. DESIGN ANALYSIS

10.1 This analysis was initially performed under Revision 0, ICN 1 of the ESFDR, with Seismic Zone 4. Revision 0, ICN 2 of the ESFDR revised the lowered criteria to Seismic Zone 3. The initial design is conservative, with foundation sizes based on physical requirements. Therefore, the analysis will reflect the higher criteria of Zone 4.

10.2 Allowable Soil Pressure = 2,000 psf (See Reference 8.1)

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10.2 Allowable Soil Pressure = 2,000 psf (See Reference 8.1)

10.3 Passive Soil Pressure = 350 psf per foot of depth (See Reference 8.1)

10.4 Concrete Properties

A. Compressive Strength (f'c) = 4,000 psi
B. Concrete weight = 150 pcf

10.5 Reinforcing Steel Yield Strength (fy) = 60 ksi

(Reference pages 6, 7, and 8 for hand calculations)

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
Civilian Radioactive Waste Management System
Management & Operating Contractor

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SUBJECT: DIESEL FUEL TANK FDN

WBS NO: 1.2.6.
DATE: 7-6-94 REV NO:
CALC NO: BABSD-000-01771-0200-00007
ORIGINATOR: M. GOMEZ
CHECKED BY:
CHECKED DATE:

10. DESIGN ANALYSIS (CONTD)

10.1 DIESEL FUEL TANK FDN

-WEIGHT EMPTY = 22.5K
FULL = 89.5K
(NOTE: PUMP WTS. ARE CONSIDERED NEGLIGABLE)

-SIZE 9'-0" ϕ × 20'-0" LONG

-LATERAL FORCES

A) WIND: $F = q_{z2} G_h C_f A_f$ (ANSI/ASCE 7-88)

$q_{z2} = .00256 (K_z)(IV)^2$
$q_{z2} = 15$ psf

$F = 15(1.32)(.6)(A_f)$
$F = 11.9 A_f$

$A_f = 9'(22) = 198^{\#}$ (TRANSVERSE WORST CASE)

$F = 11.9(198) = 2360^{\#}$

$K_z = 0.8$ 0-15'
$I = 1.07$ (CAT. III)
$V = 80$ mph
$G_h = 1.32$ <15'
$C_f = 0.6$ TABLE 12
$L/D = 20/9 = 2.22$
$D\sqrt{q_z} = 35 > 2.5$

B) SEISMIC: (UBC CHAPTER 23)

$F_p = ZIC_p W_p$
$= .4(1.5)(.75) W_p$
$F_p = .45 W_p$

$F_p = .45(89.5^K) = 40.3^K$

$Z = .4$ ZONE 4
$I = 1.5$
$C_p = .75$ TABLE 23P III.1

∴ SEISMIC GOVERNS

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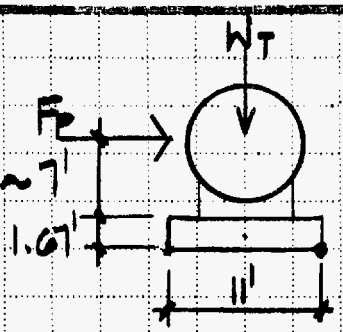
- OVERTURNING:

FOUNDATION SIZE = 11' x 22' x 1'-8"



$F_R = 40.3^K$

$W_T = 89.5^K + 11'(22')(1.67')(.15)$
$= 150.1^K$

$M_{OT} = 40.3^K (9') = 363^{K'}$

$M_R = 150.1^K (11'/2) = 826^{K'}$

STABILITY RATIO $= 826/363 = 2.3$ OK

- SOIL BEARING:

$e = M/P = 345/145 = 2.38' > L/6 = 11'/6 = 1.83'$

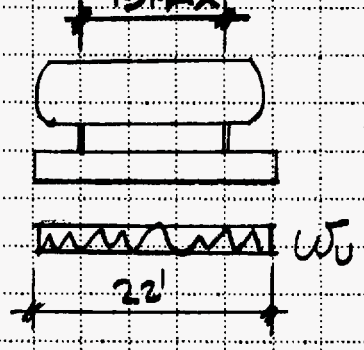
$S.B. = \frac{P}{A}\left[\frac{4L}{3L - 6e}\right] = \frac{150.1^K}{11'(22')}\left[\frac{4(11)}{3(11) - 6(2.38)}\right]$

$S.B. = 1.46\ KSF < 1.35(2) = 2.67\ KSF$ OK

- REINFORCING: DESIGN FOR MAXIMUM SUPPORT WIDTH

$w_{u\,max} = 1.4(1.7)(.75)(1.40) = 2.105$

$M_U = 2.105\left[\frac{15^2}{8} - \frac{3.5^2}{2}(2)\right] = 32.5^{K'}/_{11}$



$K_U = \frac{32.5^{K'}(12{,}000)}{(12")(16.5")^2} = 120$

$d = 20" - 3" - .5 = 16.5"$

$e = 1.33(.0023) = .0033$ ← GOVERNS

(OR) $e = .0033$

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ORIGINATOR: M. GOMEZ

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CHECKED DATE:

$A_s = .003(12)(16.5) = .59\ in^2/ft$

USE #7 @ 12" O/C E.W.

$A_s = .60\ in^2/ft$

11. CONCLUSIONS

The design shows that a concrete foundation that has minimum dimensions of 11' x 22' x 1'-8" thick, reinforced with #7 @ 12" o/c each way, is adequate to support the proposed Fuel Storage Tank and Fuel Pumps.

12. ATTACHMENTS

None.